COURSE STRUCTURE FOR M.TECH (CIVIL ENGINEERING)
SEMESTER I (Infrastructure Engineering and Management) w.e.f. 2013-2014

Sr. No	Course Code	Course Name	Teaching Scheme					Exam Scheme					
			L	T	P	C	Hrs/wk	Theory			Practical		Total
								MS	ES	IA	LW	LE/Viva	Marks
1	CE 511T	Infrastructure Planning & Engineering- I	3	1	-	7	4	30	60	10	-	-	100
2	CE512T	Project Management	3	-	-	6	3	30	60	10	-	-	100
3	CE 512P		-	-	2	1	2	-	-	-	25	25	50
4	CE513T	Project Design Studio-I	-	-	6	6	6	-	-	-	75	25	100
5	CE 514T	Elective-I(GIS Applications in Infrastructure)	3	-	-	6	3	30	60	10	-	-	100
6	CE515T	Elective IV (Ground Improvement Techniques)	3	-	-	6	3	30	60	10	-	-	100
7	MA501T	Advanced Numerical Analysis and Computer Programming	3	1	-	7	4	30	60	10	-	-	100
8	MA 501P		-	-	2	1	2	-	-	-	25	25	50
		TOTAL	15	2	10	40	27						700

MS = Mid Semester, ES = End Semester; IA = Internal Assessment (like quiz, assignments etc)

LW = Laboratory Work; LE = Laboratory Exam

CE511T Infrastructure Planning and Engineering-I										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	-	7	4	30	60	10	-	-	100

Unit I 12 hrs

Introduction: Concept of infrastructure; Need for infrastructure planning and engineering; Infrastructure development scenario in India; Scope for infrastructure management.

Overview of Indian Infrastructure Assets: Urban infrastructure, Water, Dams, Bridges, Canals, Housing, Roads, Railways, Ports, Airports, Energy , Power

Unit II 10 hrs

Infrastructure Performance: Assessment of infrastructure development related to civil engineering; Report card inspection; Energy Infrastructure: Components of energy; Power generation; Transmission; Distribution; Oil & gas; Coal; Renewable energy sources

Unit III 10 hrs

Infrastructure Interdependencies: Sustainable Infrastructure; Privatization of Infrastructure:

Infrastructure laws Cost Estimation for Designing & Maintaining Infrastructure: Financing of infrastructure projects; Case Study of Infrastructure planning & engineering of metro rail constructions.

Unit IV 12 hrs

Rural Infrastructure: Alternate construction materials; Rural housing technologies; Rural roads; Rural water supply and sanitation

Case Studies/Readings: Faculty will select 2-3 cases on infrastructure planning and engineering for reading and discussion among students

Reference Books:

1) Raghuram G (2001) Infrastructure Development and Financing: Towards a Public Private Partnership, Macmillan Publishers, New Delhi.
2) Joshi P (2001) Law Relating to Infrastructure Projects, Taxman Publishers New Delhi.
3) Alagiri D (2007) Infrastructure Development, ICFAI University Press Hyderabad

E512T Project Management										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	-	-	6	3	30	60	10	-	-	100

Unit I 10 hrs

Introduction: Definition & scope of project; Parameters affecting a project; Project planning & implementation cycle; Definition, concept & scope of project management; Role of project manager; Enhancing the probability of success of a project; Phases of a project – Identification, feasibility, execution, completion & commissioning; Project life cycle.

Project Organization: Factors responsible for organizational revolution; Formal & informal organization structures; Requirements of a project organization; Matrix organization structure; Selecting a project organization structure; Criteria to help determine a suitable organizational form in a given project environment.

Unit II 10 hrs

Project Scheduling & Planning: Scheduling principles; Bar charts (Gantt charts); Milestones charts; S-curve, Critical path method: Arrow diagram; Network logic diagram; Time estimates; Slack; Total, free & independent floats; Case studies. PERT (Project evaluation & review techniques): Three time estimates (optimistic, most likely, pessimistic); Beta distribution; Expected time; Variance in project duration; Standardized normal variable; Case studies.Network scheduling with limited resources: Resource allocation; Resource leveling; Case studies; Updating the network.Working of MS Project

Work Break Down Structure (WBS):Role of project manager in developing WBS; Rules facilitating the preparation of WBS; Typical hierarchy in the WBS of a project; Desirable characteristics of work packages; Determinants having critical influence on the work packages; Project oriented WBS; Functionally oriented WBS; Integration of WBS & organization structure.

Unit III 08 hrs

Project Appraisal:Basics of economic decision; Cash flows; Rate of return; Economic evaluation of project proposals using ROR; Economic appraisal criteria for selection of industrial projects; Shadow process; Measurement of comparative advantages; Limitation of commercial profitability; Profit maximization & efficiency; Infrastructure financing – issues, developments & prospects; Ownership structures – BOT, BOOT, BOO, BOLT.

Project Control:Concept; Control cycle; Basic controlling parameters; Line of Balance; Role of project management on control cycle; Basic planning & developing a classification system for controlling. Time control: Measures to be taken by project manager for time control.Cost control: Strategic planning & cost programming; Potentiality of cost reduction during different phases of a project; Cost planning; Control curves; Cash flow; Time cost trade-off planning for minimum costs; Cost slope concept; Crash point; Normal point; Total project cost; Controlling cost overrun & time overrun.Quality control: Need of QA/QC programs; Objectives of QA/QC; Quality assurance techniques.

Unit IV 12 hrs

Project Monitoring:Measurement of performance; Reporting of performance; Corrective measures for infavourable variations; Major functions of monitoring; Influence of decision making authority in project monitoring

Project Risk Management: Risk identification: Risk analysis; Risk response planning & mitigation measures; Case studies.

Latest Trends in Project Management: Integrated project delivery (IPD); Lean integrated project delivery (LIPD); Critical chain project management (CCPM)

Software Applications in Project Management: Working with MS Project

Reference Books:

1) Iyer P Parameshwar (2001) Engineering Project Management with case studies. Wheeler Publishing New Delhi.
2) Nicholas John M (2007) Project Management for Business and Technology: Principles and Practice, 2nd Edition, Pearson Prentice Hall New Delhi
3) Austen AD & Neele RH (1985) Managing Construction Projects: A guide to process and procedures, Dialogue New Delhi
4) Joy PK (1990) Handbook of Construction Management, Macmillan Delhi
5) Harris F & McCaffer R (2003) Modern Construction Management, BSP Professional Books Oxford/ London.
6) Wiest D J. and Leivy K F, (2010) A Management Guide to PERT and CPM: With GERT/ PDM / DCPM, Pearson Prentice Hall Publishers, New Delhi

E512P Project Management										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
-	-	2	1	2	-	-	-	25	25	50

Unit I MICROSOFT SOFTWARE 2000 14 Hrs

1. Work Breakdown Structure (WBS)
2. Project Organization Structure
3. AOA Networks
4. AON Networks
5. PDM Networks
6. Linear Time Monitoring Tools (Bar Charts / Gant Charts)
7. Editing Tasks
8. Mile Stone Charts
9. Resource Allocation
10. Resource Levelling
11. Managing Data & Resources
12. Introduction to Base Line for Monitoring Projects
13. Managing Multiple Projects
14. Project Calendar
15. Use of Filters
16. Creating a Project Report
17. Case Studies from Industry

Unit II PROJECT RISK MANAGEMENT THROUGH RISK AMP-SOFTWARE 10 Hrs

1. Risk Analysis (Quantitative)
2. Simulation of Risk weightages through Monte Carlo Simulation
3. Simulation Application for Network Path Analysis
4. Monte Carlo Simulation Application for computation of Risk Time, Risk Cost, Expected Time Expected Cost of a Project

Reference Books:

1. Iyer P Parameshwar (2001) Engineering Project Management with case studies. Wheeler Publishing New Delhi.
2. Nicholas John M (2007) Project Management for Business and Technology: Principles and Practice, 2nd Edition, Pearson Prentice Hall New Delhi

CE513P Project Design Studio-I										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
-	-	6	6	6	-	-	-	75	25	100

In this exercise students will work in small groups and undertake studies on urban water supply, urban wastewater and surface drainage planning, design and evaluation for a city or part of a city. The project design studio carries out two exercises viz. Perception studies and Area planing project. This aims to make student aware on infrastructure requirements and standards required for city level planning.

Unit I 26 hrs

Perception Studies: To carry-out quick perception study on buildings plan and building layout, road network and heirarchy, open spaces and plazas, urban infrastructure related to drinking water supply, wastewater generated, and storm water drainage. Students will prepare a small note, situation notes and sketches, photographs, drawings and flow charts based on analysis. This excercise will equip them better understanding and analyzing various design issues for next stage of project work.

Unit II 52 hrs

Area Planning Project: Area planning project is designed to make student get indepth knowledge on physical infrastructure for water supply, wastewater and stormwater for an area such as part of city or integrated townships or special economic zones or special investment regions (say around 200 ha). The area planning project demonstrates, how urban infrastructure plan are prepared? What are design standards for basic service provisions for Indian cities? How to insure equitable distribution, and how to create a synergy between resources availability and resources use? Finally, using modern software tools such as WaterCAD, SewerCAD and StormCAD the infrastructure plan for selected area to be prepared. In addition strategies for financial resources also need to be worked out.

Environmental Impact Assessment : Studio work need to carried out to give exposure about the methodology to develop Environmental Impact Assessment (EIA) reports for infrastructure projects. Also exposure need to be given for prediction and assessment of impacts on the air environment , surface water environment, soil and ground water environment; Environmental management systems –ISO 14000, Audit procedures, Certification.

The final plan will include components such as detailed objectives, population density, distribution of open spaces, development and control regulation, water supply & distribution plan, environmental impact assessment report, design standards, infrastructure plan, preliminary costing and financing strategy.

Reference Books:

1. MetCalf and Eddy Inc, (2003) Waste Water Engineering Treatment, Disposal and Reuse, Tata McGraw Hill Publishing New Delhi
2. CPHEEO (2005) Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, New Delhi.

CE514T Elective-I* GIS Applications in Infrastructure Engineering										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	-	-	6	3	30	60	10	-	-	100

Unit I 10 hrs

Introduction:Definition, Applications of GIS, History of GIS, Maps and spatial information, Computer assisted mapping and map analysis,Spatial data representation, data and coverage, Thematic characteristics of spatial data,Functions of GIS, Decision support tools for engineers Spatial and Attribute Data Modelling: Sources of spatial data- census, survey data, air photos, satellite images, field survey; Dataformats- raster and vector data, Data structures, Retrieval and reclassification of data, Comparison of Vector and Raster Methods, Acquisition of spatial data for terrain modeling, Digital terrain modeling, Modeling network,Problem of data management,Database management system, Relational database model, Spatial and attribute data, GIS database applications and development

Unit II 12 hrs

Data Input, Editing and Integration:Manual scanningand digitising, Automatic digitizing methods,Data editing, Correcting errors in attributes and spatial data,Integration of GIS database with remote sensing and GPS,

GIS Data Analysis: Measurement of distances, peimeter and area;map scale and mapping principles, Buffering and neighborhood functions, Raster and Vector overlay method: point-in-polygon, line-in-polygon and polygon-on-polygon – problems, Spatial interpolation, GIS for Surface Analysis, Network analysis: shortest path problem, travailing problem, location allocation of resources, route tracing, operational aspects of GIS

Unit III 10 hrs

GIS Modeling for Decision Support: Models of spatial processes, Natural and scale analogue models, Conceptual models, Mathematical model, Models of physical and environmental processes, Modeling human process, Gravity model, Problems related to using GIS to model spatial processes; Maps as output,Alternative cartographic and non-cartographic outputs, Spatial multimedia, GIS and
spatial decision supports, Maps as decision tool

Unit IV 07 hrs

Global Positioning System: Definition, Basics of GPS, Functional segments, Computation of 3D location, Accuracy in measurements, Errors and rectification of errors, Applications of GPS in Infrastructure

Case Studies: GIS applications in urban system, transportation planning and highway engineering, water resources and environmental engineering

Reference Books:

1. Haywood L, Cornelius S and S Carver (1988) An Introduction to Geographical Information Systems, Addison Wiley Longmont, New York.
2. Burgh PA (1986) Principles of geographical Information System for Land Resources Assessment, Clarendon Press, Oxford.
3. Burrough PA, McDonnell PA (2000) Principles of Geographical Information systems, London: Oxford University Press.
4. LoCP, Young KW Albert (2002) Concepts And Techniques of Geographic Information Systems, Prentice-Hall of India Pvt ltd, New Delhi

CE514T Elective-I* Water and Wastewater Treatment

Teaching Scheme					Examination Scheme (audit course)					
					Theory			Practical		Total
L	T	P	C	Hrs/Week	MS	ES	IA	LW	LE/Viva	Marks
3	-	-	6	3	30	60	10	-	-	100

Unit I 12 hrs

Introduction:Water Quality- Physical, chemical and biological parameters of water, Standards on water quality, Water quality indices, Water purification systems in natural systems, River bank filtration, Physical and Chemical processes of water treatment

Unit II 12 hrs

Wastewater Treatment: Biological processes, Activated sludge process and its modification, Biological Nitrification and de-nitrification, attached growth biological treatment systems, sludge and effluent disposed, Primary, Secondary and Tertiary treatment

Unit III 09 hrs

Advanced Treatment: Unit operations, unit processes. Aeration and gas transfer, Sedimentation, Filtration, Adsorption, Disinfection

Unit IV 06 Hrs

Case Studies of typical Water Treatment Plants and Waste Water Treatment Plants

Reference Books:

1. Weber WJ (1999) Physicochemical Processes for Water Quality Control, John Wiley& Sons New York
2. MetCalf and Eddy Inc, (2003) Waste Water Engineering Treatment, Disposal and Reuse, Tata McGraw-Hill Publishing New Delhi
3. PeavyHS, Rowe DR and Tchobanoglous G (1997) Environmental Engineering, McGraw–Hill Publication New York
4. CPHEEO (2005) Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, New Delhi.

CE514T Elective-I* Soildwaste and Hazardous Waste Management										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	-	-	6	3	30	60	10	-	-	100

Unit I 09 hrs

Introduction: Solid waste, Sources of wastes, classification, Characterization, Composition and Properties of solid Wastes; Hazardous waste, properties & classification of hazardous waste, legal
frame work, Waste manifest system

Unit II 10 hrs

Generation, Collection and Transportation of Waste: Generation, Methods to estimate waste quantities, Waste handling, Separation, Storage and Processing at source, Material recovery facility collection rate Collection system, Equipments used, manpower requirement, collection routes optimization, Transfer station, Method and means of transportation, Transportation of Hazardous
waste and handling

Unit III 10 hrs

Processing and Recycling: Unit operations for separation and processing, size reduction, separation, density separation, biological processing- composting, bio-methanation, Incineration-process, heat recovery, incineration products, other methods of processing – combustion, pyrolysis, gasification, energy recovery system. Types of incinerators- Liquid injection, Rotory kiln and fluid bed, Multiple-Hearth furnaces, fluidized and catalytic incinerators. Hazardous waste treatment, physicochemical process-Air stipping, stream stripping, Chemical oxidation, Supercritical fluids, Biological methods-Exsitu and Insitu Treatment

Disposal: Methods, Landfills- types, design of landfills, operation of landfills Generation, movement, control and treatment of landfill gases and leachates, standards for leachate disposal, landfill
emissions ,closure of landfill, monitoring of landfill. Land fill disposal for hazardous waste

Unit IV 10 hrs

Sitting of wastes management facilities: Sitting guidelines, Planning and developing a site for solid waste management. Site Remediation - site assessment and inspection, the hazardous system and the national priority list. Remedial Actions
Handling and treatment of Radio Active Wastes

Reference Books:

1. Sincero AP and Sincero GA (1999) Environmental Engineering – A Design Approach, Prentice Hall of India Pvt. Ltd. New Delhi
2. George Tchobanaglous, Hilary Theisen and Samuel A. Vigil (1993) Integrated Solid Waste Management, Oxford University Press London
3. Vesiland A (1999) Solid Waste Engineering, Thompson Books Oxford
4. LaGrega, MD Mercer (2001) Hazardous Waste Management, 2nd Edition, McGraw Hill Publishing New York
5. Wentz CA (1989) Hazardous Waste Management, McGraw Hill Publishing New York

CE514T Elective-I* Transportation System Analysis										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	-	-	6	3	30	60	10	-	-	100

Unit I 09 hrs

Introduction: Scope of transportation and impact on society; System planning process and problem solving process; transportation problems

Unit II 10 hrs

Transportation Technologies: Transportation technologies, suitability and adaptability, Transportation system components; Transportation system characteristics – technological and operational; Technologies for surface, below surface and above surface transportation and their combinations, suitability of such systems in urban and rural areas

Unit III 10 hrs

Analysis of Systems: Generation of alternatives; Performance evaluation of system and performance functions; Operational planning and analysis of components; Travel in space and time; Planning for non-motorized transportation; Freight transportation planning–models and methods; Residential location choice models, Car-ownership models; transportation software

Unit IV 10 hrs

Transportation Economics: Transportation demand and supply; Equilibrium between supply and demand, transportation system equilibrium; Elasticity – direct and cross; concept of consumer surplus; transport demand models – sketch planning, incremental demand model, model estimation from traffic counts; transportation cost, travel – market equilibrium

Sustainable Transportation Planning: Sustainable transportation–issues and principles; non-motorized transportation planning; Impact evaluation and impact models

Reference Books:

1. Marvin L Manheim (1980) Fundamentals of Transportation Systems Analysis, The MIT Press Cambridge, Massachusetts
2. Konstadinos G Goulias, (2002) Transportation System Planning–Methods and Applications, CRC Press, London
3. Khisty C J (2002) Transportation Engineering- An Introduction, Prentice Hall New Delhi.

CE514T Elective-I* Traffic and Transportation Planning										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	-	-	6	3	30	60	10	-	-	100

Unit I 09 hrs

Introduction: Goals and objectives, Scope of traffic and transport planning, Transport network and characteristics, Hierachical levels of transport planning, traffic forecasts, Inventory of land use

Unit II 10 hrs

Transport Planning Process: Approaches to transport planning process, Conventional vs recent approaches, Transport demand surveys and studies, Trip generation, Trip production and Trip distribution models, Multi-regression models,

Unit III 10 hrs

Modal Split Models: Behavioural vs Probabilistic models, Utility functions, Two stage model, Travel demand forecasting, Traffic assignment methods, Route-choice behaviour, Network analysis

Unit IV 10 hrs

Landuse and Transport: Lowry derivative models, Quick response techniques, Characteristics of urban structure, Town planning concepts

Preparation of Alternative Plans: Evaluation techniques, Plan implementation, Monitoring, Financing of projects, Case Studies

Reference Books:

1. Kadiyali LR (2000) Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi.
2. Meyer Michael D, Miller Eric J (2002) Urban Transport Planning, Mc Graw Hill, New York.
3. Hutchinson B G (1974) Principles of Urban Transport Planning, Mc Graw Hill, New York.
4. Khisty C J (2002) Transportation Engineering- An Introduction, Prentice Hall New Delhi.

CE515T Elective-II# Ground Improvement Techniques										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	-	-	6	3	30	60	10	-	-	100

Unit I 10 hrs

Introduction:Compaction method used in the laboratory and the field, lab compaction methods-light, heavy, kneading, vibratory, for soils and with admixtures Shallow stabilization with cement, lime, flyash and other chemical admixtures

Unit II 10 hrs

Deep stabilization using vibroflotation, compaction piles, dynamic compaction, blasting, sand drains, stone columns, lime and cement columns, grouting by permeation, displacement and jet methods.

Unit III 10 hrs

Functions and Application of Geosynthetics- Geotextiles, Geogrids, geomembranes, soil reinforcement using strips, bars etc.

Unit IV 09 hrs

Soil nailing and ground anchors, dewatering techniques, earthmoving machines and earthwork principles, piling and diaphragm wall construction, tunneling methods in soils etc.

Reference Books:

1. Purushottam Raj (1999) Ground improvement Techniques, Penguin Books Ltd, New Delhi
2. Gulhati and Manoj Dutta (2003), Geotechnical Engineering, Tata Mc-Graw Hills Manfired R. H. “Engineering Principles of Ground Modification”, McGraw-Hill Pub.Co.1990
3. Koener R M. (1985),Construction and Geotechnical Methods in Foundation Engineering. McGraw Hill Pub Co New York.
4. Hausmann M R (1990), Engineering Principles of Ground Modifications, McGraw Hill Pub Co New York.
5. Ingles O G and Metcalf J B. (1972), Soil Stabilisation: Principles and practice, Butterworths, London.
6. Ell F G. (1975),“Methods of Treatment of Unstable ground, Newness Butterworths, London

CE515T Elective-II# Design and Construction of Structures										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	-	-	6	3	30	60	10	-	-	100

Unit I 10 hrs

Introduction:Review of Limit State Design Philosophy for Beams, Slabs & Columns according to IS 456-2000. Calculation of Deflection & Crack Width according to IS 456-2000

Unit II 10 hrs

Design of Plates:Structural Behaviour, Analysis & Design of Folded Plates

Unit III 10 hrs

Design of Slabs:Design of Circular & Flat Slabs. Yield Line Analysis for Slabs.

Beams:Grid Floors Curved Beams, Deep Beams, Plain & Reinforced Concrete Walls, Corbels& Edge (Spandrel) Beams

Unit IV 09 hrs

Design using Special Materials:Execution of Reinforced Concrete, Timber, and steel structures

Reference Books:

1. N KrishnaRaju (2000) Advanced Reinforced Concrete Design, CBS Publishers & Distributors New Delhi
2. Varghese PC (2005) Advanced Reinforced Concrete Design, Prentice Hall of India New Delhi
3. H J Shah (2007) Reinforced Concrete- Volume I and II, Charotar Publishing House Anand
4. V L Shah, S R Karve (2005) Limit State Theory and Design of Reinforced Concrete, Structures Publication

CE515T Elective-II # Geo-environmental Engineering										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	-	-	6	3	30	60	10	-	-	100

Unit I 09 hrs

Introduction: Industrialization and Urbanization, Pollution, Control and remediation

Contamination: Surface contamination, Contamination transport, Soil-a Geotechnical trap, Effect of subsurface contamination, Detection of polluted zone, Monitoring and Effectiveness of designed facilities

Unit II 10 hrs

Contaminants of Solid Waste in Land-fills: Waste contaminants, landfills, types, shape and size of land fills, Liner and liner system, Cover and cover system, Stability of land fills; Land-fill construction & operation, sustainable waste management

Unit III 10 hrs

Contaminants of Slurry wastes: Slurry transported wastes, slurry ponds, operation, Embankment construction and raising, Design aspects, Environmental Impact and control

Unit IV 10 hrs

Vertical Barriers for Contaminant: Contaminated sites, Types of barriers, Soil-Bentonite slurry trench walls, Cement-Bentonite slurry trench walls, construction, material and design aspects

Geotechnical Reuse of Waste materials: Waste reduction, use in geotechnical construction, waste characteristics, transportation consideration, Engineering properties of Wastes, Waste material in Embankment and Fills.

Reference Books:

CE515T Elective-II# Safety in Infrastructure Construction										
Teaching Scheme					Examination Scheme (audit course)					
					Theory			Practical		Total
L	T	P	C	Hrs/Week	MS	ES	IA	LW	LE/Viva	Marks
3	-	-	6	3	30	60	10	-	-	100

Unit I 09 hrs

Introduction: Classification of construction, construction and safety, safety scope and benefits, personal protective equipments (PPE)

Unit II 10 hrs

Construction Accidents:Injury and Accidents, Definitions, Unsafe act –Unsafe condition, Causes, Investigations and Prevention of accidents, Hazards, Type of construction hazards, Nature,Causes and control measures, Hazard identifications and control techniques, HAZOP , FMEA, FMECA; Cost of construction injuries, Legal implications

Unit III 10 hrs

Safety Programmes:Introduction to the Concept of Safety, Need- Safety provisions on construction site, validity of Factory Act, Laws related to the Industrial Safety, Measurement of safety performance

Safety Audit: Problem areas in construction safety, Elements of an effective and safety program, Job site safety assessment, Safety meetings, Safety Incentives

Unit IV 10 hrs

Safety Organization: Safety policy, Safety record keeping, Safety Culture, Safe Workers, Safetyand First line supervisors, Safety and middle managers, Top management practices, Company activities and safety, Safety personnel-Sub contractual obligation, Project coordination and safety procedures

Reference Books:

1. Jimmy WHinze (1997) Construction Safety, Prentice Hall Inc. New Jersey
2. Richard J. Coble, Jimmie Hinze & Theo C. Haupt (2001) Construction Safety and Health Management, Prentice Hall Inc. New Jersey
3. Kwaku A Tenah and Jose M Guevera (1995) Fundamental of Construction Management and Organization,Prentice Hall of India New Delhi

MA503T Advanced Numerical Techniques and Computer Programming										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	-	7	4	30	60	10	-	-	100

Unit-I 12 hrs

Concept of Error in Computation; Interpolation: Introduction of Finite differences, Operators, Newton Gregory Forward Interpolation Formula, Newton Gregory Backward Interpolation Formula, Gauss's Forward and Backward Interpolation Formula, Stirling's Central Difference Formula, Lagrange's Interpolation Formula for unevenly spaced data, Inverse Interpolation, Divided Differences, Properties of Divided Differences, Newton's Divided Difference Formula, Relation between Divided Differences and Ordinary Differences; Splines, Cubic Splines, Formulae for Derivatives, Newton-Cotes's Quadrature Formula, Trapezoidal rule, Simpson's one-third rule, Simpson's Three-Eighth rule, Weddle's rule, Romberg's method, Double Integration.

Unit-II 09 hrs

Concept of Rate of Convergence; Numerical solution of Algebraic & Transcendental Equations: Introduction, Descarte's Sign rule, Newton-Raphson method, it's applications, Solution of non linear simultaneous equations, Newton-Raphson method for multiple roots, Horner's method, Lin-Bairstow's method or Method for Complex Root, Graeffe's root squaring method, Comparison of various methods.

Unit-III 09 hrs

Numerical Solution of Ordinary and Partial Differential Equations: Picard's method, Taylor's method, Euler's method, Runge – Kutta method, Modified Euler's method, Predictor Corrector methods: Adam's method, Milne's method. Difference Quotients, Graphical representation, Classification of PDE's of 2^{nd} order, Elliptic equations, Solutions of Laplace equation by Liebmann's, iteration method, Poisson's equation, Parabolic equation (One dimension heat equation),Bender-Schmidt method, Crank- Nicholson method.

Unit-IV 09 hrs

Curve Fitting: Principle of Least Squares, Fitting a Straight line and other Curves for a given set of data points .

Solution of Simultaneous Algebraic Equations: Direct methods, Iterative methods: Gauss-Jacobi's method, Gauss-Seidal method, Relaxation method.

The Finite Element Method: Introduction, Method of Approximation, The Rayleigh-Ritz Method, The Galerkin Method, Application to One dimensional and two dimensional problems.

Approx 39 hrs Lecture

Reference Books:

1. Introductory Methods for Numerical Analysis by S.S. Sastry, Fourth edition, Prentice Hall of India (2009)
2. Numerical Methods in Engineering and Science with Programs in C & C++ by B.S. Grewal, Khanna Publisher (2010)
3. Numerical Methods for Scientific and Engineering Computation by M.K. Jain, S.R.K. Iyenger and R.K. Jain, 5^{th} edition, New Age International (2007)
4. S.D. Conte & C. de Boor: Elementary Numerical Analysis - an algorithmic approach, Mc Graw Hill, 1980, 3rd Ed., New York.

5. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyenger, 3rd edition, Narosa (2002).
6. Advanced Engineering Mathematics by E. Kreyszig, 9th edition John Wiley & Sons (2005)
7. Numerical Methods by E. Balaguruswamy
8. Numerical Methods for Mathematics, Science & Engineering by John H. Mathews
9. Applied Numerical Analysis by Curtis F Gerald & Patrick O. Wheatley
10. Numerical Methods for Engineers, Steven C. Chapra and Raymond P. Canale, Tata McGraw-Hill Publishing Company

MA503P Advanced Numerical Techniques and Computer Programming										
Teaching Scheme					Examination Scheme (audit course)					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
-	-	2	1	2	-	-	-	25	25	50

List of practicals will be given by concerned faculty in the class

Reference Books: